WHAT IS CLAIMED IS:

1. A polymer electrolyte fuel cell comprising:

an electrode including a catalyst layer and a diffusion layer, said catalyst layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said catalyst layer differs between at said upstream portion and at said downstream portion, said upstream portion of said catalyst layer having a structure for preventing a drying-up of said cell, said downstream portion of said catalyst layer having a structure for preventing a flooding of said cell.

2. A fuel cell according to claim 1, wherein said structure of said catalyst layer varies gradually along said reactant gas flow direction.

3. A fuel cell according to claim 1, wherein said structure of said catalyst layer varies in a step-wise manner along said reactant gas flow direction.

4. A fuel cell according to claim 1, wherein said structure of said catalyst layer for preventing a drying-up of said cell at said upstream portion includes at least one of the following (1) - (4) structures:

(1) said catalyst layer includes a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is larger at said upstream portion than at any other portion of the catalyst layer;

(2) said catalyst layer includes pores, wherein a pore size of said catalyst layer is smaller at said upstream portion than at any other portion of the catalyst layer;

(3) said catalyst layer includes pores, wherein a pore amount of said catalyst layer is smaller at said upstream portion than at any other portion of the catalyst layer; and

(4) a thickness of said catalyst layer is greater at said upstream portion than at any other portion of the catalyst layer.

5. A fuel cell according to claim 1, wherein said structure of said catalyst layer for preventing a flooding of said cell at said downstream portion includes at least one of the following (1) - (4) structures:

(1) said catalyst layer includes a coating of the same resin as an electrolyte as one of components of the catalyst layer, wherein a ratio in amount of the same resin as the electrolyte to all of the components of said catalyst layer is smaller at said downstream portion than at any other portion of the catalyst layer;

(2) said catalyst layer includes pores, wherein a pore size of said catalyst layer is larger at said downstream portion than at any other portion of the catalyst layer;

(3) said catalyst layer includes pores, wherein a pore amount of said catalyst layer is larger at said downstream portion than at any other portion of the catalyst layer; and

(4) a thickness of said catalyst layer is smaller at said downstream portion than at any other portion of the catalyst layer.

6. A fuel cell according to claim 1, said diffusion layer being sectioned into a plurality of portions including an upstream portion and a downstream portion along a reactant gas flow direction,

wherein a structure of said diffusion layer differs between at said upstream portion and at said downstream portion, said upstream portion of said diffusion layer having a structure for preventing a drying-up of said cell, said downstream portion of said diffusion layer having a structure for preventing a flooding of said cell.

7. A fuel cell according to claim 5, wherein said structure of said diffusion layer varies gradually along said reactant gas flow direction.

8. A fuel cell according to claim 5, wherein said structure of said diffusion layer varies in a step-wise manner along said reactant gas flow direction.

9. A fuel cell according to claim 5, wherein said structure of said diffusion layer for preventing a drying-up of said cell at said upstream portion includes at least one of the following (1) - (4) structures:

(1) said diffusion layer includes pores, wherein a pore size of said diffusion layer is smaller at said upstream portion than at any other portion of the diffusion layer;

(2) said diffusion layer includes pores, wherein a pore amount of said diffusion layer is smaller at said upstream portion than at any other portion of the diffusion layer;

(3) said diffusion layer has a water repellent layer and a substrate layer, wherein a hydrophobicity of said water repellent layer of said diffusion layer is stronger at said upstream portion than at any other portion of the diffusion layer; and

(4) a thickness of said diffusion layer is greater at said upstream portion than at any other portion of the diffusion layer.

10. A fuel cell according to claim 5, wherein said structure of said diffusion layer for preventing a flooding of said cell at said downstream portion includes at least one of the following (1) - (4) structures:

(1) said diffusion layer includes pores, wherein a pore size of said diffusion layer is larger at said downstream portion than at any other portion of the diffusion layer;

(2) said diffusion layer includes pores, wherein a pore amount of said diffusion layer is larger at said downstream portion than at any other portion of the diffusion layer;

(3) said diffusion layer has a water repellent layer and a substrate layer, wherein a hydrophobicity of said water repellent layer of said diffusion layer is weaker at said downstream portion than at any other portion of the diffusion layer; and

(4) a thickness of said diffusion layer is smaller at said upstream portion than at any

other portion of the diffusion layer.

11. A fuel cell according to claim 8, wherein said water repellent layer of said diffusion layer includes a fluororesin and carbon particles as components of said water repellent layer, and wherein in order to weaken the hydrophobicity of said water repellent layer of said diffusion layer at said downstream portion, said diffusion layer includes at least one of the following (1) - (3) structures:

(1) a ratio in amount of said fluororesin to all of the components of said water repellent layer smaller at said downstream portion than at any other portion of said diffusion layer;

(2) a hydrophilicity of carbon of said water repellent layer stronger at said downstream portion than at any other portion of said diffusion layer; and

(3) said substrate layer of said diffusion layer having had a hydrophilic procedure applied at said downstream portion.